

Remarks

Claim 1, as amended, appear in this application for the Examiner's review and consideration. Claim 1 has been amended to recite that the steel sheet further contains inside the steel sheet within 2.0 μm from the interface of the plating layer and the steel sheet at least one type of internal oxide particles selected from Al oxide, Si oxide, Mn oxide, or a complex oxide composed of at least two of Al, Si, and Mn, wherein the oxide particle has an average diameter of 0.001 to 1 μm in a density of not more than 1×10^{11} particles/cm². Support for amended claim 1 can be found, for example, at paragraphs [0010], [0030], [0032], [0054], [0059] and Figure 1 of the published application. Accordingly, no new matter has been introduced.

Claim 1 is rejected under 35 U.S.C. §103(a) as being unpatentable over JP 2001-323355 to Honda ("JP '355") for the reasons set forth on pages 3-5 of the Office Action. Applicants respectfully traverse.

The molten zinc plated steel sheet of the present invention is characterized by forming inside the steel sheet within 2.0 μm from the interface of the plating layer and the steel sheet oxide particles comprised of at least one type of oxide of Al oxide, Si oxide, Mn oxide, or a complex oxide comprised of at least two of Al, Si, and Mn alone or in combination, thereby suppressing the production of an external oxide layer on the surface of the steel sheet. By promoting the formation of an internal oxide layer, the oxides are finely dispersed inside the steel sheet. As a result, both the wettability between the surface of the steel sheet and the bondability of the plating are improved. In addition, according to the present invention, the size of the oxide particles present inside the steel sheet near the plating layer/steel sheet interface is preferably not more than 1 μm . The reason is that if the average diameter of the oxide particles is more than 1 μm , at the time of processing the molten zinc plated steel sheet, the oxide particles easily become starting points of fracture and the corrosion resistance of the processed parts is degraded, that is, detrimental effects easily occur when putting the molten zinc plated steel sheet into practical use.

Applicants have conducted an experiment based on the conditions described in JP '355 and determined the properties of the steel sheet of JP '355. Applicants submit herewith an unsigned Declaration under 37 C.F.R. § 1.132 by Dr. Yoichi Ikematsu ("the Ikematsu Declaration"), a named co-inventor of the present application. A fully executed copy will be filed forthwith. The data presented in the Ikematsu Declaration revealed that the oxide formed on the steel sheet of JP '355 clearly exists in layers at the interface between the steel

sheet and the plated layer, therefore, the process of JP '355 does not teach or suggest suppressing the production of an external oxide layer on the surface of the steel sheet by promoting the formation of an internal oxide layer as taught by the present application. Furthermore, the Ikematsu Declaration revealed that the average diameter of the internal oxide particles (e.g. Mn-Si-O, Mn-O, and SiO₂) formed in the steel sheet of JP '355 is more than 1 μm (*see* Experiment 1 and Figure A of the Ikematsu Declaration). These results place the disclosure of JP '355 outside the scope of the present claims. Applicants have also performed an experiment based on the present application, which confirmed that the average diameter of the internal oxide particle formed on the surface of the heat treated steel sheet is less than 1 μm (*see* Experiment 0 and figure 2 of the Ikematsu Declaration).

In addition, Applicants have conducted a second experiment which determined the properties of the steel sheet of JP '355. Applicants submit herewith an unsigned Declaration under 37 C.F.R. § 1.132 by Kazuhiko Honda ("the Honda Declaration"), a named co-inventor of the present application. A fully executed copy will be filed forthwith. The data presented in the Honda Declaration revealed that the process of JP '355 produces a steel sheet that contains surface flaw defects. On the other hand, the zinc plated steel sheet of the present invention is free from plating gaps or other plating defects, including surface flaw defects such as those contained in the steel sheet of JP '355. Therefore, for at least the reasons presented above, one skilled in the art would not have arrived at the high strength molten zinc plated steel sheet of the present invention based on the disclosure of JP '355. Accordingly, it is respectfully requested that the Examiner withdraw the rejection of claim 1 under 35 U.S.C. §103(a) over JP '355.

Claim 1 is rejected under 35 U.S.C. §102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over U.S. Patent No. 6,398,884 to Kyono ("US '884") for the reasons set forth on pages 5-6 of the Office Action. Applicants respectfully traverse.

Applicants have determined that the black spots shown in Figures 9a-c of US '884 are the internal oxides formed in the surface layer portion of the iron matrix and as evidenced by Figs. 9a-9c, the average diameter of the internal oxide particles formed in the steel sheet of US '884 is more than 1 μm (*see* the Ikematsu Declaration). This result place the disclosure of US '884 outside the scope of the present claims. Therefore, as US '884 does not disclose the presently claimed steel product with the size of the oxide particles present inside the steel sheet near the plating layer/steel sheet interface being less than 1 μm , and provides no reason for one of ordinary skill in the art to make or use the presently claimed steel product, the

present claims are not obvious over US '884. Accordingly, the rejection of claim 1 under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over US '884 cannot stand, and should be withdrawn.

Claim 1 is rejected under 35 U.S.C. §103(a) as being unpatentable over JP 2000-290730 to Suzuki ("JP '730") for the reasons set forth on pages 6-8 of the Office Action. Applicants respectfully traverse.

Applicants have conducted an experiment based on the conditions described in JP '730 and determined the properties of the steel sheet of JP '730 (*see* Experiment 2 and Figure B of the Ikematsu Declaration). The data presented in the Ikematsu Declaration revealed that even if any oxide particles having a diameter of more than 0.01 μm and less than 1 μm (as defined in the present invention) were formed in the process of JP '730, the oxide particles formed would be energetically unstable, and disappear from the internal oxide layer due to Ostwald growth. Therefore, JP '730 provides no reason for one of ordinary skill in the art to make or use the presently claimed steel product, the present claims are not obvious over JP '730. Accordingly, the rejection of claim 1 under 35 U.S.C. 103(a) as obvious over JP '730 cannot stand, and should be withdrawn.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the present application is in condition for allowance. Early and favorable action by the Examiner is earnestly solicited. If the Examiner believes that issues may be resolved by a telephone interview, the Examiner is invited to telephone the undersigned at the number below.

Respectfully Submitted,

Date: October 20, 2009

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